Outcomes as Mediators: A Review

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Introduction

- Recent calls have been to shift from syndromal approaches in psychology toward a functional, process-driven account, linked to evidence-based procedures (e.g., Hayes & Hofmann, 2018; Hofmann & Hayes, 2019).
- As an initial step towards process-based analyses, the present analysis explores the mediating effects of outcomes of interest on other outcomes of importance.
- Mediational analyses can be conceptualized as a first step in exploring functional relationships among variables, leading to a causal account of mechanisms of change (Kazdin & Nock, 2003)
- This strategy may reveal implications for the ways in which outcomes are functionally linked to one another, while helping practitioners identify the most important target of change, when generalized effects are desired.

Methods

- The present dataset was drawn from a larger ongoing study on all successful mediators identified in the psychosocial literature
- This larger dataset (1,536 studies) is comprised of studies (out of a preliminary database of 54,812 studies) that indicate in their abstracts:
    (1) reporting mediational or process-level change analyses
    (2) in the context of a psychosocial therapeutic intervention
    (3) evaluated in a longitudinal experimental design
- All studies selected for inclusion in the present study were identified as being indicative of outcome-based mediational data by an expert panel (i.e., Joseph Ciarrochi, Steven Hayes, & Stefan Hofmann)
- The present dataset includes **57 outcome-based mediators** from a total of **48 studies** describing outcomes as mediating other outcomes of interest. Mediational data, including timing of measurements, mediational tests utilized, and effect sizes (where provided) were extracted from the studies.
- Four undergraduate research assistants independently identified the problem addressed, intervention used, control condition, sample size, measure used for mediator, timing of mediation, outcomes, timing used for outcomes, method of mediation test, and effect size for each of the 48 studies identified. One graduate student analyzed the undergraduate data for inter-observer agreement, and resolved any disagreements between undergraduate raters.

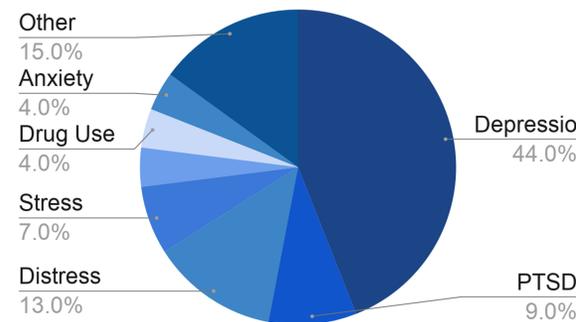## Results

Figure 1 Assessed Mediators by Percentage

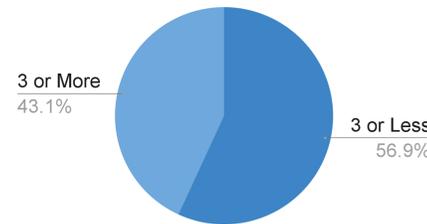*Figure 2 Number of Mediation Data Collection Points by Percentage*

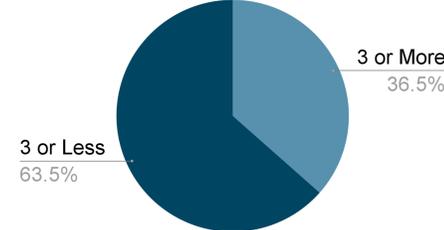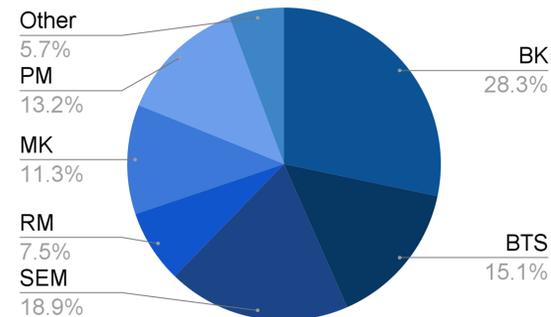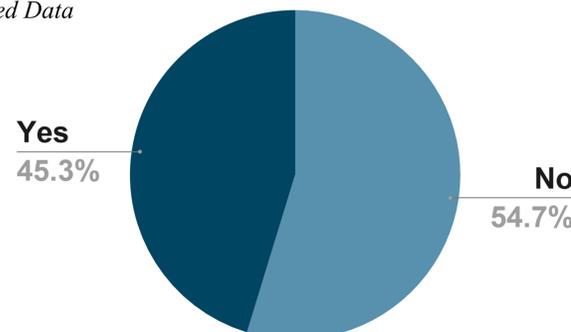*Figure 3 Number of Outcome Data Collection Points by Percentage*

Figure 4 Mediation Tests by Percentage

Path Modeling ('PM'), Baron and Kenny ('BK'), Mackinnon ('MK'), Structural Equation Modeling (SEM), Bootstrapping (BTS)

Fig 5 Proportion of Studies with Effect Size / Proportion of Variance Explained Data

Results

- *Figure 1:* Depressive symptoms emerged as the most commonly assessed outcome that mediates other outcomes, constituting approximately 44% of all mediators identified in the present dataset.
- *Figure 2 and 3:* The majority of outcomes-as-mediators and outcomes were measured at baseline, post-treatment, and follow-up, rather than concurrently throughout treatment. This trend was stronger in the case of outcomes-as-outcomes.
- *Figure 4:* The three most commonly utilized mediation tests in the present data set were Baron and Kenny (28%), Structural Equation Modeling (19%), and Bootstrapping (15%).
- *Figure 5:* 54% of studies did not either collect or report effect size or proportion of variance explained data for the measured mediators.

Discussion

- The importance of process-data (including outcome-based process data) is describing the ways in which individuals change over time as a function of treatment.
- Depression emerged as a relatively robust as a mediator (e.g., accounting for 45.0% of change in PTSD symptoms in prolonged exposure, accounting for 23.5% of change in functional disability).
    - This finding may be indicative of important intervention strategies for treating multi-problem patients (that is, treating depressive symptoms may result in beneficial downstream effects on other areas of concern).
    - However, this may also be an artifact of the degree to which depression is a commonly studied construct within the psychological intervention literature.
- The ways in which outcomes are highly correlated with one another may be indicative of common dysfunctional psychological processes (e.g., experiential avoidance, emotion dysregulation) that manifest in different symptom categories.
- At a meta-level, the results from the present study represent a significant problem within mediation literature.
    - There is no agreed-upon gold standard on how to measure and test for mediation (as evidenced by the degree to which various mediation tests were utilized in the present sample).
    - The majority of studies assessed mediation and outcome data at three or fewer timepoints (56.9% and 63.5%, respectively), resulting in limited understanding of *how* changes in outcomes affect other outcomes of interest over time.
    - The majority of studies (54.7%) failed to report effect size data, limiting the degree to which effects could be compared across studies.

References

Hayes, S. C., & Hofmann, S. G. (Eds.). (2018). *Process-based CBT: The science and core clinical competencies of cognitive behavioral therapy*. New Harbinger Publications.

Hofmann, S. G., & Hayes, S. C. (2019). The future of intervention science: Process-based therapy. *Clinical Psychological Science*, 7(1), 37-50.

Kazdin, A. E., Nock, M. K. (2003). Delineating mechanisms of change in child and adolescent therapy: Methodological issues and research recommendations. Journal of Child Psychology and Psychiatry, 44, 1116–1129.